Diabetes Education SERVICES

Welcome to Diabetes in the 21st Century

President, Diabetes Educational Services
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DiabetesEd.net

Diabetes in the 21st Century: A Clinical and Educational Update

1. Describe type 1 and type 2 diabetes.
2. State importance of inpt BG mgmt.
3. Identify strategies to improve glucose levels after evaluating patterns.
4. List diabetes management guidelines.
5. State strategies to prepare pt for discharge.
6. Discuss medical nutrition therapy

CDC Announces

1 in 3 Americans may have Diabetes by 2050

Boyle, Thompson, Barker, Williamson
2010, Oct 22:8(1)29
www.pophealthmetrics.com

Diabetes in America 2013

- **26 million or 8.3%**
- **79 million have pre diabetes**
- New cases increased **90%** in past 10 years.
  - 4.8 per 1,000 people during 1995-1997 to
  - 9.1 per 1,000 in 2005-2007 in 33 states.

CDC 2011

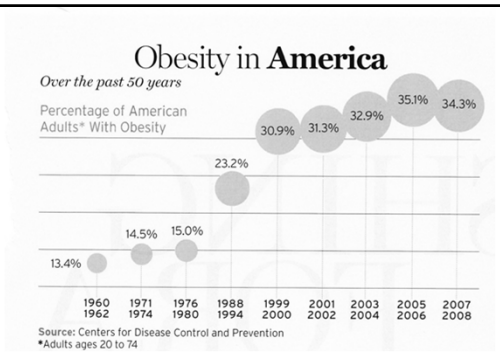
Global Epidemic

- Every 10 seconds
  - 1 person dies with diabetes
  - 2 people develop diabetes
- Every year
  - 3 million deaths
  - 6 million new cases
- World Diabetes Day is November 14th
  - *Understand diabetes, take control*
  - *(2009-2013 theme)*

Age-adjusted Diabetes Prevalence
20 yrs or older, by race/ethnicity— U.S. 2008

Native Americans	16.5%
Alaska Natives	16.5%
Blacks	11.8%
Hispanics	10.4%
Asian Americans	7.5%
Whites	6.6%

In 2002, Native Hawaiians and Japanese and Filipino residents of Hawaii aged twenty years or older were approximately 2 times as likely to have diagnosed diabetes as white residents of Hawaii



- 34% BMI 30 +, 34% BMI 25-29
- We burn 100 cals less a day at work
- 1/3 of all overwt people don't get diabetes

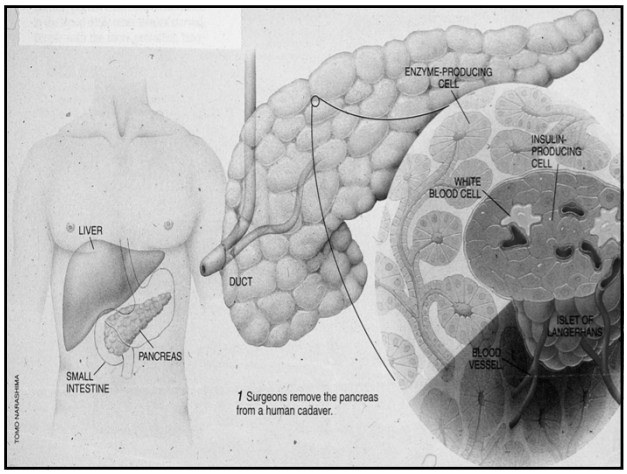
New and Early Research on Gut Bacteria

- Leaner people appear to have higher proportion of bacteroidetes
  - Gut bacteria less efficient at converting food to calories
- Obese people appear to have higher levels of firmicutes
  - Gut bacteria very efficient at calorie extraction
- Bacteria tend to run in families

Newsweek. Don't Just Blame Calories – July 6, 2010 DM Forecast – Feb 2011

Free Live Webinars and Live Seminars at DiabetesEd.net

- Free Webinars
  - Preparing to take CDE
  - New Frontiers
  - New Medications



Role of the Pancreas Endocrine Functions

Beta Cells - Insulin

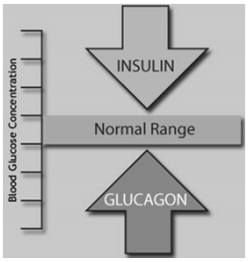
Anabolic hormone - helps store glucose as glycogen in muscle, liver

- secreted in response to elevated glucose
- halts breakdown of glycogen in liver
- increases protein synthesis, fat storage
- powerful hypoglycemic

Beta Cells - Amylin

- secreted in 1:1 ratio with insulin
- Causes satiety
- Lowers post-prandial glucagon response
- Slows gastric emptying
- Type 1 make none
- Type 2 make less than normal amounts

Role of the Pancreas Endocrine Functions



Alpha cells - Glucagon

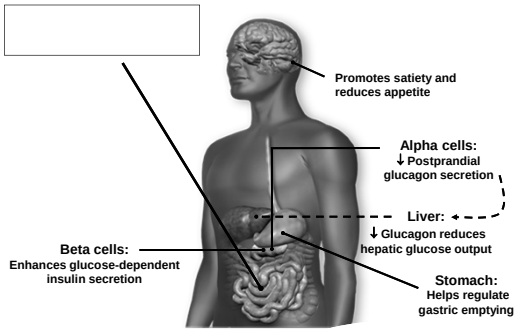
Opposes action of insulin at the liver

- stimulated in response to low glucose levels
- stimulates liver to convert glycogen to glucose
- inhibits liver from glucose uptake
- causes hyperglycemia

Hormones Effect on Glucose

Hormone	Effect
Glucagon (pancreas)	↑
Stress hormones (kidney)	↑
Epinephrine (kidney)	↑
Insulin (pancreas)	↓
Amylin (pancreas)	↓
Gut hormones - incretins (GLP-1) released by L cells of intestinal mucosa, beta cell has receptors)	↓

GLP-1 Effects in Humans
Understanding the Natural Role of Incretins

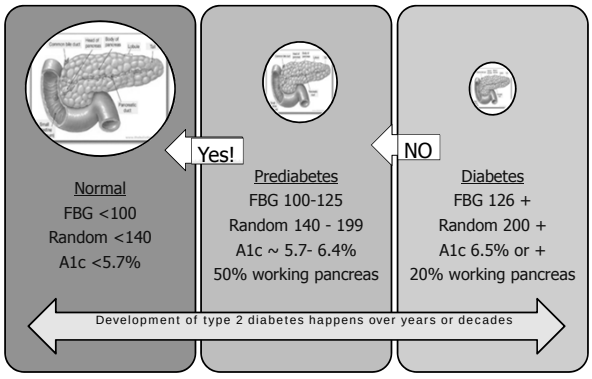


Adapted from Flint A, et al. *J Clin Invest*. 1998;101:515-520
Adapted from Larsson H, et al. *Acta Physiol Scand*. 1997;160:413-422
Adapted from Nauck MA, et al. *Diabetologia*. 1996;39:1546-1553
Adapted from Drucker DJ. *Diabetes*. 1998;47:159-169

Signs of Diabetes

Polyuria	Glycosuria, H_2O losses
Polydipsia	Dehydration
Polyphasia	Fuel Depletion
Weight loss	Loss of body tissue, H_2O
Fatigue	Poor energy utilization
Skin and other infections	Hyperglycemia increases incidence of infection
Blurry vision	Osmotic changes

Natural History of Diabetes



4 Types of Diabetes

- Type 1
- Type 2
- Gestational
- Other Causes

Case Study

1. Pt profile: 5'8", 192 lb male

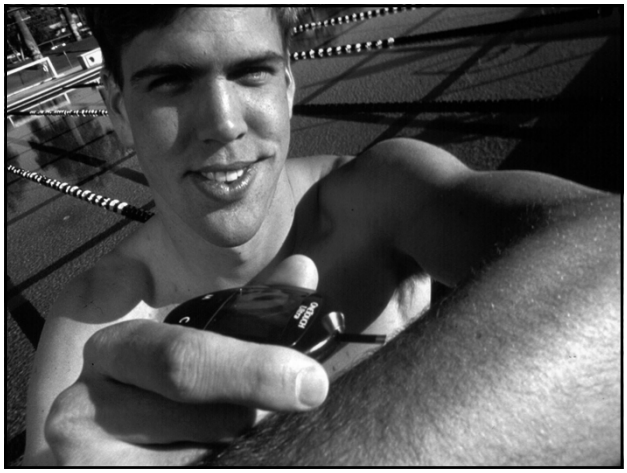
Diabetes 12 years, on insulin 3 yrs

What type of DM and how do you know?

2. Pt profile: 5'6", 108 lb female

On insulin 3u Novolog before meals, 10u Lantus at bedtime

What type of DM and how do you know?



Type 1 Diabetes – Genetics and Risk Factors

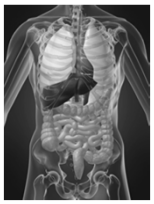
- 1- 400 to 1-1000 = Risk of type 1 in gen pop
- 1-20 to 1-50 in offspring of diabetes parents
- Combo of genes and disease susceptibility
- Risk Factors:
  - Autoimmunity tends to run in families
  - Higher rates in non breastfed infants
  - Viral triggers: congenital rubella, coxsackie virus B, cytomegalovirus, adenovirus, mumps.
  - Hygiene Hypothesis: Could gut bacteria influence immunity?

Type 1 Diabetes – 10% of all DM

- Auto-immune pancreatic beta cells destruction
- Most commonly expressed at age 10-14
- More rapid destruction in youth (vs. adults)
- Insulin sensitive (require 0.5 - 1.0 units/kg/day)
- Auto-immune Markers
  - Positive Glutamic Acid Decarboxylase (GAD), Insulin & Islet Cell Autoantibodies (IAA & ICA's)
  - New marker – ZnT8 (zinc transporter) antibodies to this (ZnT8) found in 60-80% of type 1
- Other clues
  - Low C-Peptide level < 0.5
  - Usually lean and present in sick state

Type 1 Diabetes Associated with other immune conditions

- Celiac disease (gluten intolerance)
- Thyroid disease
- Addison's Disease
- Rheumatoid arthritis
- Other



What Does Type 1 Look Like?

Mary Tyler Moore

Sharon Stone
Halle Berry

Bret Michaels

From Debbie Nagata's slide collection

Adam Morrison

Nick Jonas

Justice Sonia Sotomayor

Type 1 in Hospital

- 43 yr old admitted to evaluate angina.
- Morning blood sugar is 142.
- You walk in with his insulin dose.
- The patient says, "I will bottom out if I take that much insulin."
- "That dose won't touch my blood sugar"

What do you say?

"How Sweet It Is"

Diabetes 2 - Who is at Risk?

(ADA Clinical Practice Guidelines)

1. Testing should be considered in all adults who are overweight (BMI $\geq$ 25) and have additional **risk factors**:
   - First-degree relative w/ diabetes
   - Member of a high-risk ethnic population
   - Habitual physical inactivity
   - PreDiabetes
   - History of heart disease

Diabetes 2 - Who is at Risk?

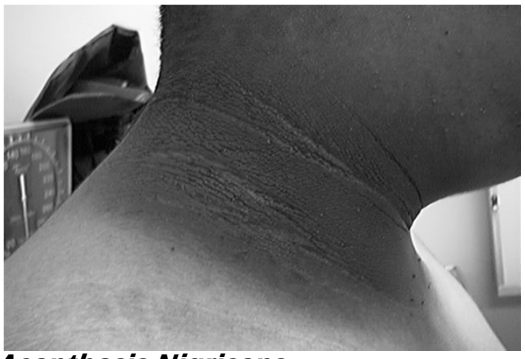
(ADA Clinical Practice Guidelines)

Risk factors cont'd

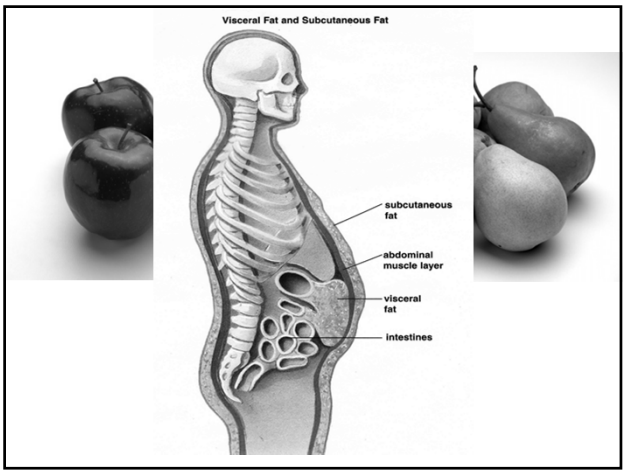
- HTN - BP > 140/90
- HDL < 35 or triglycerides > 250
- baby >9 lb or history of Gestational Diabetes Mellitus (GDM
- Polycystic ovary syndrome (PCOS)
- Other conditions assoc w/ insulin resistance:
  - Severe obesity, acanthosis nigricans (AN)

Acanthosis Nigricans (AN)

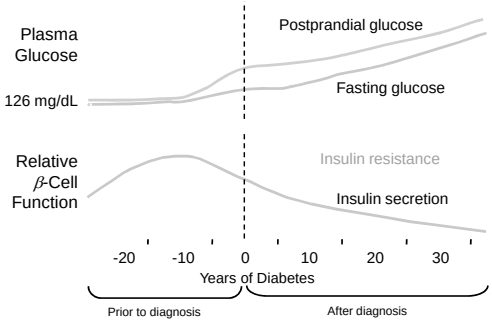
- Signals high insulin levels in bloodstream
- Patches of darkened skin over parts of body that bend or rub against each other
  - Neck, underarm, waistline, groin, knuckles, elbows, toes
  - Skin tags on neck and darkened areas around eyes, nose and cheeks.
- No cure, lesions regress with treatment of insulin resistance



Acanthosis Nigricans

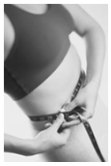


Natural Progression of Type 2 Diabetes



Adapted from Bergenstal et al. 2000; International Diabetes Center.

Cardio Metabolic Risk - 5 Hypers -



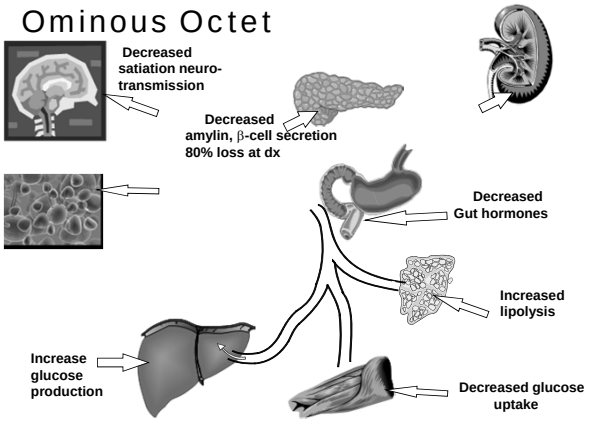
- Hyperinsulinemia (resistance)
- Hyperglycemia
- Hyperlipidemia
- Hypertension
- Hyper"waistline"emia (35" women, 40" men)

Manifestations of Insulin Resistance

Diabetes is also associated with

- Fatty liver disease
- Obstructive sleep apnea
- Cancer; pancreas, liver, breast
- Alzheimer's
- Depression

Ominous Octet



Comparison of Type 1 and Type 2

	Type 1	Type 2
Obesity	x	xxx
Family History	xxx	xxx
Respond to oral agents	0	xxx
Ketosis	xxx	x
Antibodies present	xxx	0
Age of onset	teens	30-40s

Other Causes of Hyperglycemia

- Steroids
- Agent Orange
- Tube feedings / TPN
- Transplant medications
- Cystic Fibrosis

Regardless of cause, requires treatment
- Insulin always works
- Sign of pancreatic malfunction

Life Study - Mr. Calhoun

Mr. Calhoun is 72 years old, has recently lost 10 pounds and complains of feeling very tired lately. He is admitted with an infected foot ulcer. His WBC is 12.3, glucose 284. He smokes a pack of cigarettes a day. He takes glyburide 10mg daily and doesn't have a meter to test his BG.

- What risk factors and signs of diabetes?
- What type of diabetes does he have?

What Do You Say? Mr. Calhoun asks you

- What is type 2 diabetes?
- Will this go away?
- Will I get complications?
- Will I need to take diabetes medication for the rest of my life?
- How come I got diabetes?
- Do I have to check my blood sugars?

I don't want **to!**

How will it help me?

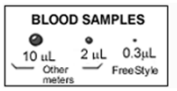
- See if your treatment plan is working
- Make decisions regarding food and/or med adjustment when exercising
- Find out how that pizza affected your BG
- Avoid unwanted weight gain
- Enhanced athletic performance
- Find patterns
- Manage illness

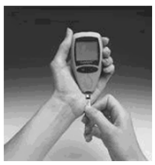
How Often Should I Check?

- Be realistic!!
- Type 1 – 3 to 8 times a day
- Type 2 – as often as needed to achieve goals (ADA)
- Consider:
  - Types and timing of meds
  - Goals
  - Ability (physical and emotional)
  - Finances

New Meters – a little goes a long way

- 0.3 microliters of blood
- minimal pain



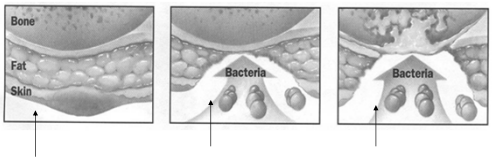


Customer Service (toll-free): Look for 800 number

Foot Care

Lift the sheets and look at the Feets!

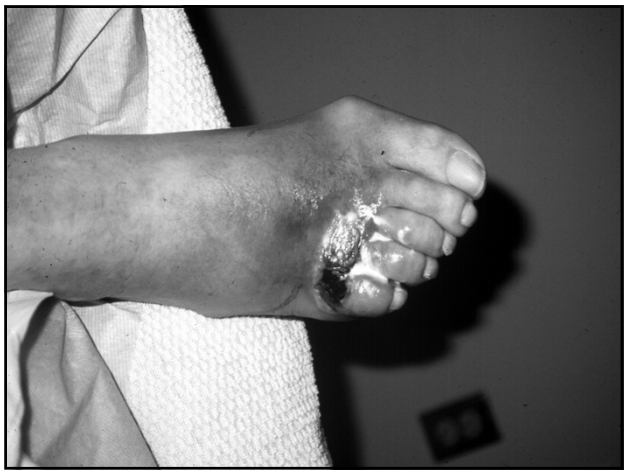
Foot Wounds

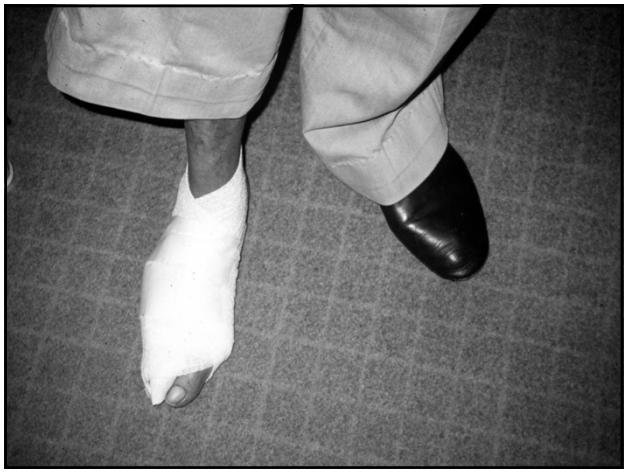


Blisters
infection
Calluses

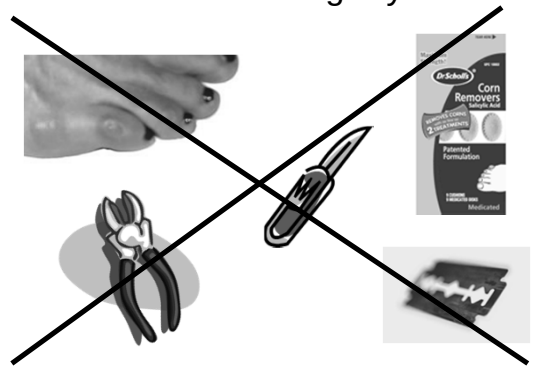
Ulcers

Bone

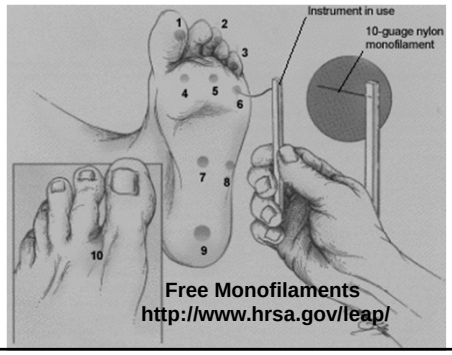




No Bathroom Surgery



5.07 monofilament = 10gms linear pressure



Three Most Important Foot Care Tips

- Inspect and apply lotion to your feet every night before you go to bed.
- Do NOT go barefoot, even in your house. Always wear shoes!
- Every time you see your doctor, take off your shoes and show your feet.

In Patient Strategies – Start Early, Focus on Survival Skills

Find Natural Teaching Moments Early on

- Have them demo insulin injection
- Ask them for their signs of hypoglycemia. Review action and prevention.
- When checking Blood Glucose, ask how often they check & their glucose goals.
- When tray arrives, which foods carbs?
- Head to Toe assess.. Who cuts your toenails?
- Make sure to document education

Tips for Succeeding with Diabetes Education

- Assess
  - where they are with their diabetes
  - "What is the most difficult thing right now for you in managing your diabetes?.
- Identify barriers
- Acknowledge – avoid judgement
- Provide emotional support, resources and info

KISS and Listen

- Keep
- It
- Short and
- Simple

- Listen, understand, respect, converse
- We don't change behavior – our job is to inspire, inform, support and facilitate their efforts to ID and achieve goals

Diabetes Bingo
"DiaBingo"
Shout out Right Answer

DiaBingo

B Frequent skin and yeast infections
B A BMI of ____ or greater is considered overweight
B To reduce complications, control **A**1c, **B**lood pressure, **C**holesterol
B PreDiabetes – fasting glucose level of ___ to ____
B Erectile dysfunction indicates greater risk for ____
B Diabetes – fasting glucose level____ or greater
B Type 1 diabetes is best described as an _____ disease
B People with diabetes are _____ times more likely to die of heart dx
B Elevated triglycerides, < HDL, smaller dense LDL
B Each percentage point of A1c = _____ mg/dl glucose
B At dx of type 2, about __% of the beta cell function is lost
B Diabetes – random glucose ____ or greater

Complications - Why?

- Degree of hyperglycemia "glucose toxicity"
- Duration of hyperglycemia
- Genes
- Multiple risk factors: smoking, vascular disease, dyslipidemia, hypertension, other

Diabetes Complications

- Heart disease leading cause of death.
- CAD death rates are about 2 -4x's as high as adults without diabetes (it's not getting better)
- Risk of stroke is 2 - 4 times higher
- 60% - 65% of people with DM have HTN.
- DM accounts for 40% of new cases of ESRD
- 60 - 70% have mild - severe forms of neuropathy
- Diabetes is the leading cause of blindness
- Accounts for 50% of lower limb amputations

Control Matters

- **Prevention**
- **Trials**
- **Practice Recommendations**

Financial Advisor

- Mid 30s, friendly, he smiles to greet you and you notice his gums are inflamed. You'd guess a BMI of 26 or so, with most of the extra weight in the waist area.
- If you could give him some health related suggestions, what would they be?

Preventing Pre Diabetes

Best Shake For People with Diabetes

"The only diet shake I recommend is the shake your booty makes when you exercise."

From Debbie Nagata's slide collection

Can Type 2 be Prevented in Older Adults?

Overall, 9 of 10 new cases of diabetes attributable to these 5 lifestyle factors.

- Physical activity (30 mins a day)
- Dietary score (higher fiber intake, low saturated fat and *trans*-fat, lower mean glycemic index)
- Not Smoking
- Alcohol use (up to 2 drinks a day);
- BMI <25 and waist circumference

89% risk reduction when all at goal.

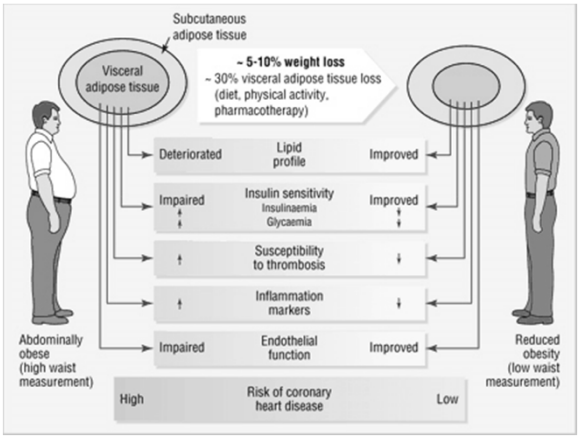
35% relative risk reduction for each additional

Dariush Mozaffarian, MD, *Arch Intern Med.* 2009;169(8):798–807.

Diabetes Prevention Program (DPP) August 2001

3, 234 people w/ IGT randomized to Placebo, Diet/Exercise or Metformin for 3 years

- Standard Group - 29% developed DM
- Lifestyle Results - 14% developed DM
  - 30 mins daily mod activity/ low fat diet reduced DM risk by 58% (71% for 60yrs +)
  - On avg, participants lost 5-7% of body wt
- Metformin 850 BID - 22% developed DM
  - reduced risk by 31% (less effective with elderly and thinner pt's)



Goals of Care

ABC's of Diabetes

A1C
Blood Pressure
Cholesterol

www.diabetes.org/makethelink

Glucose and BP Control Matter

- 1% decrease in A_1c reduces microvascular complications by 35%
- 1% decrease in A_1c reduces diabetes related deaths by 25%
- B/P control (144/82) reduced risk of:
  - Heart failure (56%)
  - Stroke (44%)
  - Death from diabetes (32%)

Lancet 352: 837-865, 1998

ABCs of Diabetes –

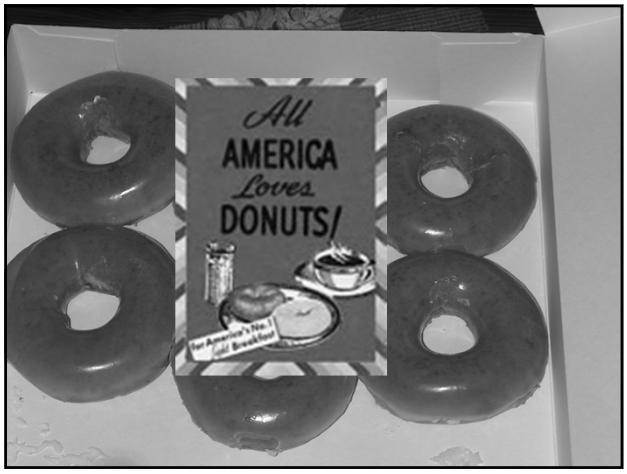
- A1c less than 7% (avg 3 month BG)
  - Pre-meal BG 70-130
  - Post meal BG <180
- Blood Pressure < 140/80
- Cholesterol
  - HDL >40
  - LDL <100 (if CHD, <70)
  - Triglyceride < 150

A1c and Estimated Avg Glucose (eAG) 2008

A1c (%)	eAG
5	97
6	126
7	154
8	183
9	212
10	240
11	269
12	298

eAG = 28.7 x A1c-46.7 ~ 29 pts per 1 %

Translating the A1c Assay Into Estimated Average Glucose Values – ADAG Study
Diabetes Care: 31, #8, August 2008



Diabetes Bingo
"DiaBingo"
Shout out Right Answer

DiaBingo- G

G ADA goal for A1c is less than ____%

G People with DM need to see their provider at least every month

G Blood pressure goal is less than

G People with DM should see eye doctor (ophthalmologist) at least

G The goal for triglyceride level is less than

G Goal for my HDL cholesterol is more than

G The goal for blood sugars 1-2 hours after a meal is less than:

G People with DM should get this shot every year

G People with DM need to get urine tested yearly for _____

G Periodontal disease indicates increased risk for heart disease

G The goal for blood sugar levels before meals is:

G The activity goal is to do ___ minutes on most days

Mr. Jones - What are Your Recommendations?

Patient Profile

64 yr old with type 2 for 11 yrs. Hx of CVD.

Labs:

- A1c 9.3%
- HDL 37 mg/dl
- LDL 114 mg/dl
- Triglyceride 260mg/dl
- Proteinuria - neg
- B/P 142/92

Self-Care Skills

- Walks dog around block 3 x's a week
- Bowls every Friday
- 3 beers daily
- Widowed, so usually eats out
- 15 lbs overweight

Glucose Management and Hospitalized Patients

In hospitalized patients with critical illness, hyperglycemia is a signal that warrants our attention.

Hospitals and Hyperglycemia What's the Big Deal?

- Hyperglycemia is associated with increased morbidity and mortality in hospital settings.
  - Acute Myocardial Infarction
  - Stroke
  - Cardiac Surgery
  - Infection
  - Longer lengths of stay

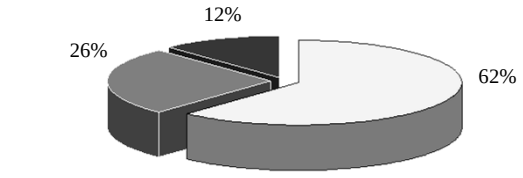
Stress response and hyperglycemia

- Decreased WBC's
- Catabolism
- Abnormal inflammatory response
- Endothelial cell dysfunction
- Increased clotting, blood viscosity
- Tissue breakdown
- Inflammatory changes
- Increased blood pressure, pulse

Leads to: Longer lengths of stay, complications, death

Diabetes Care, v. 27, #2, Feb 2004

Hyperglycemia*: A Common Comorbidity in Medical-Surgical Patients in a Community Hospital



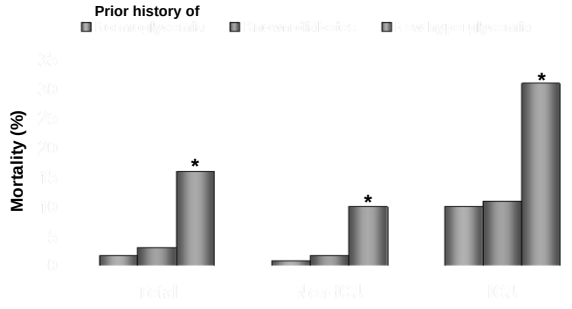
n = 2,020

* Hyperglycemia: Fasting BG ≥ 126 mg/dl or Random BG ≥ 200 mg/dl X 2

Umpierrez G et al, J Clin Endocrinol Metabol 87:978, 2002

Umpierrez et al

Effect of Hyperglycemia on Hospital Mortality



*P<.01 compared with normoglycemia and known diabetes.

Umpierrez GE et al. *J Clin Endocrinol Metab*. 2002;87:978-982.

BG Above Normal = Trouble

- Pre Diabetes
  - Fasting Glucose = 100-125mg/dl
  - A1c 5.7 – 6.4%
- Diabetes
  - Fasting Glucose = 126 mg/dl +
  - Random Glucose = 200 mg/dl +
  - A1c 6.5% +

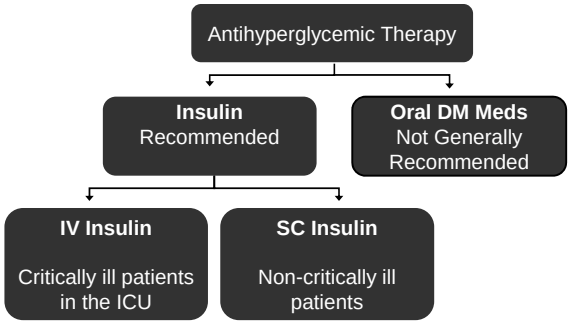
Any blood glucose above 140 requires treatment

Umpierrez et al

Diabetes Detectives Needed

- On average – takes 6.5 years to diagnose diabetes
- 1/4 of all people with diabetes don't know they have it

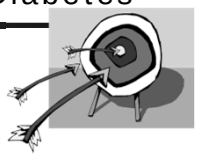
Recommendations for Managing Patients With Diabetes in the Hospital Setting



1. ACE/ADA Task Force on Inpatient Diabetes. *Diabetes Care*. 2006 & 2009
2. *Diabetes Care*. 2009;31(suppl 1):S1-S110..

Umpierrez et al

Management of Hyperglycemia and Diabetes



- Non-ICU
  - Basal/bolus therapy (MDI)
    - NPH and Regular insulin
    - Long-acting and rapid-acting insulin
    - Premixed insulin
- ICU and Critical Care
  - Insulin Drips
  - Basal /Bolus

Glucose Goals For Hospitalized Patients

Sub-Q Insulin

- Blood glucose goals:
  - Premeal 100 -140
  - Post meal <180

Insulin Drip Goals

- glucose goal 140-180

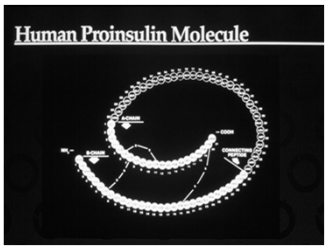
UCLA Santa Monica - UCLA Medical Center
and
Orthopædic Hospital

Patient Name: ____
Date of Birth: ____
Medical Record #: _

Adult Subcutaneous Insulin Orders

Insulin – the Ultimate Hormone Replacement Therapy

Objectives:
- Discuss the actions of different insulins
- Describe using pattern management as an insulin adjustment tool.



Life Study – Mrs. Jones

Mrs. Jones is 62 years old, a little heavy and complains of feeling tired and urinating several times a night. She is admitted with a urinary tract Infection. Her WBC is 12.3, glucose 237. She is hypertensive with a history of gestational diabetes. No ketones in urine.

Life Study – Mrs. Jones

- How would we manage her BG in hospital?

Initiating Insulin in Hospital

Stop oral agents - Obtain patient wt in kg

Calculate total daily dose (TDD) as 0.3-0.7 units per kg/day

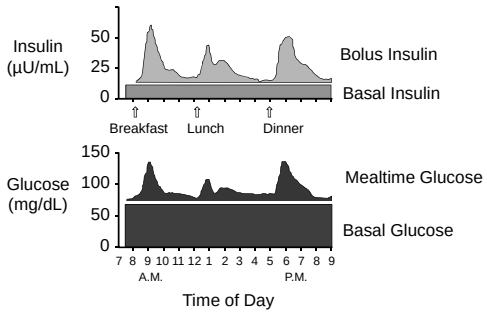
Choose the dosing schedule

50% of TDD as basal insulin	50% of TDD as prandial or nutritional insulin

Use Correction Insulin for BG above goal

Adjust according to results of BSGM	Adjust dose for NPO status or changes in clinical status

Physiologic Insulin Secretion: 24-Hour Profile



How Much Insulin Does a Patient Need?

- It depends, based on:
  - Body weight
    - Overwt, normal wt, or thin
  - Frail, elderly
  - Eating status
    - Normal, poor intake or NPO
  - Renal or hepatic insufficiency
  - Type of Diabetes
  - Current meds; steroids, insulin, oral dm agents
  - Infected or Septic

Insulin Action Teams

- Bolus: lowers after meal glucose levels
  - Rapid Acting
    - Aspart, Lispro, Glulisine
  - Short Acting
    - Regular

- Basal: controls glucose between meals, hs
  - Intermediate
    - NPH
  - Long Acting
    - Detemir (Levemir)
    - Glargine (Lantus)

Bolus Insulins (½ of total daily dose ÷ meals)

Name	Onset	Peak Action
*Aspart (NovoLog)	5-15 min	0.5 -1.5 hrs
Lispro (Humalog)		
Glulisine (Apidra)		

*Aspart is insulin of choice

Short Acting – for gastroparesis patients

Regular	30 -60 min	2 - 3 hrs

Insulin Therapy Components

- Prandial or meal insulin – a bolus insulin that covers food, IV dextrose, enteral nutrition, TPN or other nutritional supplements
- Correction insulin – bolus insulin dosed to correct for hyperglycemia that occurs despite use of basal and nutritional insulin
  - Usually given before meals w/ prandial insulin
- Basal insulin – long acting insulin covers between meals and through night

Bolus Insulin Summary

- Aspart, Humalog, Apidra, Regular
- Starts working fast (15-30 mins)
- Gets out fast (3-6 hours)
- Post meal BG reflects effectiveness
- Should comprise about ½ total daily dose
- Covers food or hyperglycemia.
  - 1 unit
    - Covers ≈ 10 -20 gms of carb
    - Lowers BG ≈ 30 – 50 points

More than 200 units a Day?

- Consider U-500 (5 x's more potent)
  - 1 unit on U-100 syringe = 5 units insulin
  - Has basal/bolus properties
  - Dosing – based on individual patient
    - 2 – 3 times a day
  - Safety is number one concern
    - Must have Endocrinology consult
    - TB Syringe must be used

U-500 Insulin: When More With Less Yields Success: *Diabetes Spectrum March 20, 2009 vol. 22 no. 2 116-122*

Dosing Conversion for U-500 using U-100 vs TB Syringe

U-500 Dose	U-100 Insulin Syringe/5	TB Syringe x.002
25	5	0.05
50	10	0.1
75	___	0.15
___	20	0.2
125	25	____
150	____	____
175	35	____
200		0.4

Quick Calculation

- Pt takes:
- 300 units of insulin a day.
- A1c 10.3%
- Convert patient to u-500
- 60% am / 40% pm
  - Morning dose
  - Before dinner dose

Bolus Insulin Timing

- How is the effectiveness of bolus insulin determined?
  - Before next meal blood glucose
- Inpt Glucose goals (ADA) – may be modified by provider/pt
  - 1-2 hours post meal <180
  - Before next meal – 100- 140

Choosing the Right Bolus Insulin Algorithm

If the patient does not eat > 50 % of meals or is NPO, do not give the mealtime insulin.

1. Insulin type: Novolog
2. Algorithm: (circle the appropriate column below)
   - #1 - For insulin sensitive patients i.e. BMI < 20, Type 1 DM or ESRD.
   - #2 - For average patients i.e. BMI 20-29, known Type 2 DM.
   - #3 - For insulin resistant patients i.e. BMI >30 or on steroid therapy.
   - Other - Recommend Inpatient Diabetes Service Consultation.

Calculating Correction Bolus

- Algorithm 1
  - Insulin Sensitive - BMI < 20, Type 1, ESRD
- Algorithm 2
  - For avg pt, BMI 20-29, Known Type 2
- Algorithm 3
  - Insulin resistant pt - Obese, on steroids

Consider continuing usual home insulin dose

Mealtime Bolus

- Carbohydrate/ Prandial Coverage
  - Match the insulin to the carbohydrates
  - 1 unit for 8gms
  - 1 unit for 10 gms
  - 1 unit for 15 gms
  - 1 unit for 20 gms

Resistant

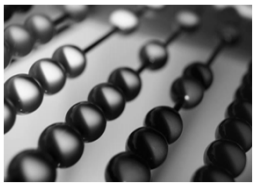
Sensitive

- Adjust ratios depending on

Post meal glucose and patterns

Please calculate the following.

- Ate 45 gms of carb
- How much insulin?
  - 1:8
  - 1:10
  - 1:15



- Ate 75 gms of carb
- How much insulin
  - 1:10
  - 1:20
  - 1:15

- Blood Glucose 84
- Blood Glucose 147

Max Carb Servings per Meal

- Breakfast
  - 45 gms
  - 3 servings carb

- Lunch / Dinner
  - 75 gms or
  - 5 servings carb

Now What?

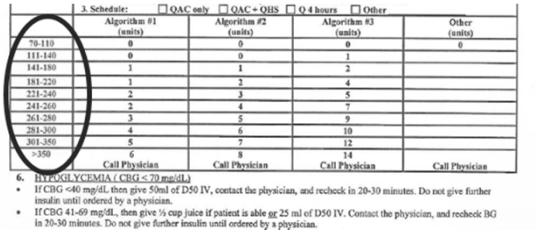
- Nurse had an emergency and pt already ate lunch?

- Nurse administered insulin and pt only ate a few bites of turkey and drank non sugar tea?
- You just gave 3 units of Aspart and patient needs to go to OR NOW!

Now that we covered food, what about Elevated BG?

- That's where the Correction Bolus comes into play.

Correction Bolus



3. Schedule: ☐ QAC only ☐ QAC + QHS ☐ Q 4 hours ☐ Other

	Algorithm #1 (units)	Algorithm #2 (units)	Algorithm #3 (units)	Other (units)
70-110	0	0	0	0
111-140	0	0	1	
141-180	1	1	2	
181-220	1	2	4	
221-240	2	3	5	
241-260	2	4	7	
261-280	3	5	9	
281-300	4	6	10	
301-350	5	7	12	
>350	6	8	14	
	Call Physician	Call Physician	Call Physician	Call Physician

6. HYPOGLYCEMIA (CBG < 70 mg/dL)
- If CBG <40 mg/dL then give 50ml of D50 IV, contact the physician, and recheck in 20-30 minutes. Do not give further insulin until ordered by a physician.
- If CBG 41-69 mg/dL, then give ½ cup juice if patient is able or 25 ml of D50 IV. Contact the physician, and recheck BG in 20-30 minutes. Do not give further insulin until ordered by a physician.

Basal Insulins
(½ of total daily dose)

Long Acting	Peak Action	Duration
Detemir (Levemir)	No peak	6 - 24 hrs
Glargine (Lantus)	No peak	20- 24 hrs

Intermediate Acting	Peak Action	Duration
NPH	4-10 hrs	10-16

Fasting BG reflects efficacy of basal

Basal Insulin Summary

- NPH, Levemir, Lantus
- Covers in between meals, through night
- Starts working slow (4 hours)
- Stays in long (12-24 hours)
  - NPH 12 hrs
  - Levemir, Lantus 20-24 hrs
- Fasting blood glucose reflects effectiveness

Combination SQ Insulin

Insulin Type	Onset	Duration
Humalog Mix 75/25: 75% NPL, 25% lispro 50/50: 50% NPL, 50% lispro	5-15 min	10-16 hrs
NovoLog Mix 70/30: 70% NPA, 30% aspart	5-15 min	10-16 hrs
NPH + Reg Combo 70/30: 70%N /30%R 50/50: 50%N /50%R	30 – 60 min	10-16 hrs

Considerations:

- Pre-mixed, difficult to fine tune therapy

UCLA Santa Monica - UCLA Medical Center and Orthopaedic Hospital

Patient Name: ____
Date of Birth: ____
Medical Record #: _

Adult Subcutaneous Insulin Orders

A. Basal Insulin; choose one type of basal insulin.
Typical starting doses are 0.3 units/kg/day.

Glargine insulin (Lantus®)
- ❑ _____ units subcutaneously at _____ a.m.

and/or
- ❑ _____ units subcutaneously at _____ p.m.

Detemir insulin (Levemir®)
- ❑ _____ units subcutaneously every ____ a.m.

and/or
- ❑ _____ units subcutaneously every ____ p.m.

NPH insulin
- ❑ _____ units subcutaneously q.a.m. **and**
- ❑ _____ units subcutaneously q.h.s.
- ❑ _____ units subcutaneously q. ____ hours

Calculate Basal Insulin Needs

- Typical starting dose
  - Body wt in Kg x .3
  - May need more or less based on clinical presentation
  - 10 units common starting dose

Less 0.1 u/kg — More 0.35 u/kg

Thin, elderly, ↑ creat — Heavy, infection, steroids

Inpt Study – Mrs. Jones

Mrs. Jones is 62 years old, weighs 70kg and complains of feeling tired and urinating several times a night. She is admitted with a urinary tract Infection. Her WBC is 12.3, glucose 237. She is hypertensive with a history of gestational diabetes. No ketones in urine. A1c 8.9%

- What insulin dose would we start Mrs. Jones on?

Insulin Dose – Mrs. Jones

- Basal
  - 0.3 units/kg = 21units
- Insulin/Carb ratio
  - 1:15
- Why?
  - Depends on clinical picture and other oral meds
  - Average weight, good oral intake, type 2

Corrective Insulin – Novolog – Algorithm 2

Rapid/Fast Acting Insulin

Blood Glucose	Insulin Dose
70-110	0 unit
111-140	0 unit
141-180	1 unit
181-220	2 unit
221-240	3 units
241-260	4 units
261-280	5 units
281-300	6 units
301-350	7 units
>350	8 units and call MD

Mrs. Jones – Carb 1:15
Alg 2 correction, 21 unit Lantus hs

	Break	Lunch	Dinner	HS
Day 1	admit	219 4 + 2u	243 5 + 4u	219
Day 2	129 3 u	197 5 + 2u	184 5 + 2u	195 - NPO
Day 3	67 Held ins	gone	119 clear liquids 3 units	104
Day 4	73 3 units	81 5 units	109 4 units	d/c

Preparation for Surgery

- Try to schedule surgery in am, resume meds/insulin when eating and stable.
- Basal Insulin: Night before
  - Lantus/Detemir – 100%
  - NPH –
    - Give 100% night before
    - 50% am dose
- Corrective insulin dose: as prescribed
- Have D5 or D10 IV available in case of hypo

BG Running Low?

- Possible Causes
  - Too much insulin
    - Premeal bolus
    - HS basal
  - Glucose toxicity improving
  - Infection improving
  - Stopped/lowered steroids
  - Poor kidney function
  - Skipped meal, poor PO intake
  - Not eating enough carbs

Hypoglycemia Symptoms

- Autonomic
  - Anxiety
  - Palpitations
  - Sweating
  - Tingling
  - Trembling
  - Hypoglycemic Unawareness
- Neuroglycopenia
  - Irritability
  - Drowsiness
  - Dizziness
  - Blurred Vision
  - Difficulty with speech
  - Confusion
  - Feeling faint

Hypoglycemia – "Limiting Factor"

- Defined as glucose of 70mg/dl or below
- 50% of episodes occur during the night
- Higher mortality rate with severe hypoglycemia secondary to sulfonylureas
  - Especially (chlorpropamide) Diabenese® and (glyburide) Micronase®, Diabeta®
- Blood glucose levels don't describe severity, response is individual

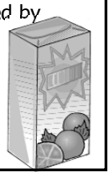
UCLA Hypo Guidelines

BG 41 – 69 mg/dl

- If eating:
  - ½ cup of juice
- Not eating
  - 25 ml of D50 IV
- Contact MD
- Recheck and retreat every 15 mins until BG > 70
- DO NOT give further insulin until ordered by MD

BG <40 mg/dl

- Give 50 ml D50 IV
- Contact MD
- Recheck and retreat every 15 minutes until BG > 70
- DO NOT give further insulin until ordered by MD



15 - 20 Gms Carb Sources

- 3 - 4 Glucose Tablets
- 8 - 10 Lifesavers candy
- 2 to 3 peppermints
- 2 Tablespoons Raisins
- 4 - 6 oz's Nondiet soda
- 4 oz's Fruit Juice
- 8 oz Milk (non fat)
- Peds – 15 Skittles

BG Too Low? Insulin Adjustment Guidelines

- Before meal Blood glucose <70?
  - Implement hypoglycemia protocol
  - Evaluate cause and make needed adjustments
    - Missed meal?
    - Too much insulin?
- Morning blood glucose < 100?
  - Decrease evening Lantus
- Evaluate trends, provide feedback

- Mrs. Jones is improved and ready to go home.
- What glucose management strategies for home?
- Her A1c = 8.9%

Discharge insulin Algorithm

Discharge Treatment

A1C < 7%	A1C 7%-9%	A1C >9%
Re-start outpatient treatment regimen (Orals and/or insulin)	Re-start outpatient oral agents and D/C on glargine once daily at 50-80% of hospital dose	D/C on basal bolus at same hospital dose. Alternative: re-start oral agents and D/C on glargine once daily at 50-80% of hospital dose

Clinical Guidelines for the Managment of Hyperglycemia in Hospitalized Patients in a Non-Critical Care Setting

Discharge Teaching

- What supplies will she need?
- What top 5 things do we need to teach her?
- What resources can we provide?
- What referrals?

5 Survival Skills

1. Basics of Diabetes
2. Can patient perform self blood glucose monitoring? Do they need meter?
3. Can pt safely take meds / insulin? Teach side effects.
4. Meal Planning?
5. Self Care

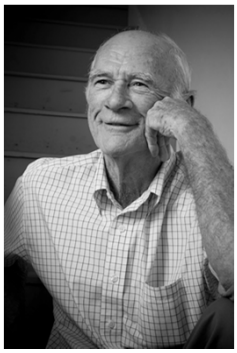
Follow-Up plan - Does pt know who to contact when need help?

When to Call Provider?*

- Blood glucose <70
- Blood glucose > 250 twice in a day (adults)
- Blood glucose >300 anytime, adults and peds
- *When sick

**Individualize based on pt/provider*

Mr. R has Pneumonia How Much Insulin Needed?



- Creatinine 1.6
- 76 years old
- Not very hungry
- BMI 19
- Weighs 80kg
- Glucotrol 5mg at home
- A1c 7.2%

Calculate Basal Insulin Needs

- Body wt in Kg x 0.2
- 80kg x 0.2 = 16 units once daily

3 days poor intake, pt started on Tube Feeding

- If on continuous tube feeding, how would this change his insulin regimen?
- If on intermittent tube feeding, how would this change his insulin regimen?
- If patients tube feeding is interrupted, what precautions would you take?

Glycemic Management of the Patient Receiving Enteral Nutrition

Continuous enteral nutrition (EN)
- Basal insulin: NPH Q8 or Q12
- Prandial bolus insulin: to match the feeding

Cycled enteral nutrition
- Based on situation: possibilities include:
- Basal insulin
- Bolus insulin administered q4 to 6 hours
- Correctional insulin given for BG above goal

Bolus enteral nutrition
- Rapid acting analog or short acting insulin given prior to each bolus

If tube pulled out, hang D10% at 40cc/hr

Corrective Insulin – Novolog – Algorithm 1

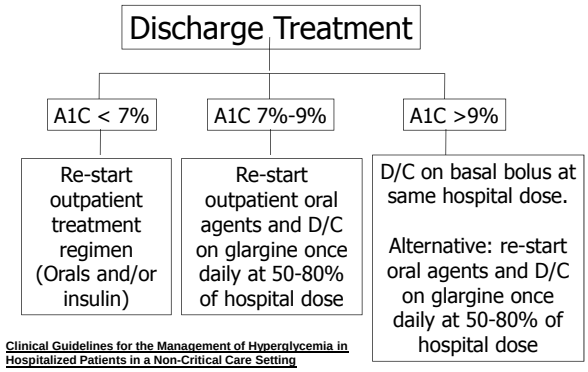
Rapid/Fast Acting Insulin

Blood Glucose	Insulin Dose
70-110	0 unit
111-140	0 unit
141-180	1 unit
181-220	1 unit
221-240	2 units
241-260	2 units
261-280	3 units
281-300	4 units
301-350	5 units
>350	6 units and call MD)

Mr. R- Pattern – meal + correction Algorithm 1 plus 18u Lantus hs

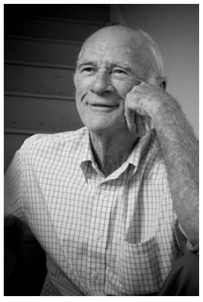
	Break	Lunch	Dinner	HS
Day 1		admit	381 3 + 6 units	198
Day 2	98 3 units	127 3 units	69 ins held	98 RN Held Lantus
Day 3	146 3 +1	67 Ins held	72 tube feeding 4 times a day	207 3 +1 unit
Day 6	142 3 + 1 unit	129 Tube pulled – start D10 IV 3 units	Pt feels funny 63 Ins held	184

Discharge insulin Algorithm



Clinical Guidelines for the Management of Hyperglycemia in Hospitalized Patients in a Non-Critical Care Setting

Mr. R after 9 days feeling better. Eating again, regaining strength. DC today.



- What glucose mgmt strategy?
- What supplies will he need?
- What top 3 things do we need to teach him?
- What resources and referrals?

5 Survival Skills

1. Basics of Diabetes
2. Can patient perform self blood glucose monitoring? Do they need meter?
3. Can pt safely take meds / insulin? Teach side effects.
4. Meal Planning?
5. Self Care

Follow-Up plan - Does pt know who to contact when need help?

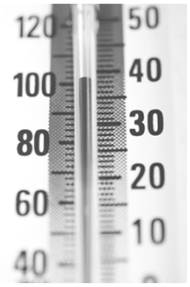
How Much Insulin Needed? Mr. K

- Wt 120kg
- Creat 0.9
- Infected Foot Ulcer
- Asthma
- Meds
  - Metformin
  - Exenatide (ran out)
  - Actos (worried about ankles swelling)
- A1c 10.8%

Started on Prednisone 60mg qd for Asthma

- Blood glucose levels running 300-500.

BG Running High?



- Possible Causes
  - Glucose Toxic
  - Infection
  - Started on steroids
  - Physical stress
  - Insulin dose too low

BG Too High? Insulin Adjustment Guidelines

- Morning BG > 140?
  - Consider:
    - Could pt be having nocturnal hypo?
    - Increasing evening Lantus by 10%
- Pre Lunch/Dinner BG > 140?
- Post meal BG > 180?
  - Consider:
    - Increasing mealtime coverage
    - Increasing insulin correction scale

Corrective Novolog Insulin Resistant - Algorithm 3

Insulin Resistant, BMI >30, Steroids

Blood Glucose	Insulin Dose
70-110	0 unit
111-140	1 unit
141-180	2 unit
181-220	4 unit
221-240	5 units
241-260	7 units
261-280	9 units
281-300	10 units
301-350	12 units
>350	14 units and call MD)

Calculate Basal Insulin Needs

- Body wt in Kg x 0.3
- 120kg x 0.3

Mr. K- Pattern (1:10 carb ratio, Algorithm 3 and 36 Lantus am

	Break	Lunch	Dinner	HS
Day 1		admit	432 8 + 14	182
Day 2	292 4 + 10	417 8 + 14	391 8 + 14	234 5
Day 3	318 5 + 12	497 8 + 14	408 8 + 14	367 14
Day 4	423 4 + 14	429 insulin drip started		

Mr. K BG Levels Too High Insulin Drip Started

- 100 units insulin in 100 cc NS Bag
- 1 cc = 1unit of insulin

Society of Hospital Medicine listing of sample Insulin Drip Protocols

IV Insulin Infusion

Give extra IV Push insulin x 1 if initial:

- BG 200 -300 – 5units
- BG >300 10 units

- Monitor BG Q 1 hour for first 4 hours or if BG <100 or >200. Otherwise, monitor Q 2 hours.

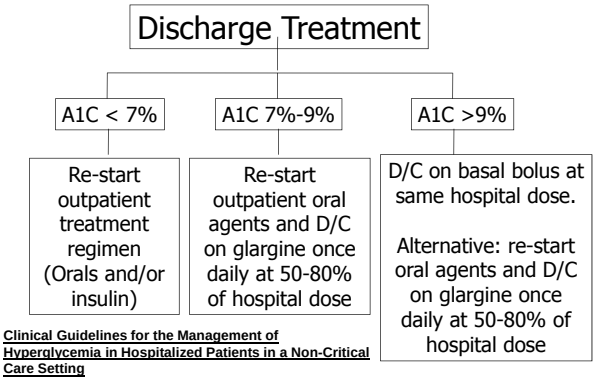
Initial Infusion Rate

- 3 algorithms:
  - A = insulin sensitive BMI ≤25
  - B = insulin resistant BMI ≥ 30
  - C = Special order only
  - Custom
- If patient eating, also needs novolog at meals

Don't Stop Insulin Infusion…

- Before giving Sub Q Basal insulin!
- Give SubQ 2 hours before stopping drip

Discharge insulin Algorithm



Clinical Guidelines for the Management of Hyperglycemia in Hospitalized Patients in a Non-Critical Care Setting

What Glucose Mgmt Strategy for Discharge?

- Waistline 46”
- Infected Foot Ulcer
- A1c 10.8%
- Asthma (on pred)
- Meds
  - Basal/Bolus Insulin
  - Metformin

MR K. Stable, ready for discharge.

- What is your biggest concern?
- What supplies will he need?
- What top 3 things do we need to teach him?
- What resources and referrals?

5 Survival Skills

1. Basics of Diabetes
2. Can patient perform self blood glucose monitoring? Do they need meter?
3. Can pt safely take meds / insulin? Teach side effects.
4. Meal Planning?
5. Self Care

Follow-Up plan - Does pt know who to contact when need help?

Diabetes Meds for Type 2: Objectives

1. Describe the main action of the 5 different categories of type 2 diabetes medications.
2. Discuss strategies to determine the right medication for the right patient.
3. List the side effects and clinical considerations of each category of medication.

Resources for Medications

- Partnership for Prescription Assistance
  - www.pparx.org
- NeedyMeds.org
- www.rxassist.org

Action/Classes of Type 2 Meds

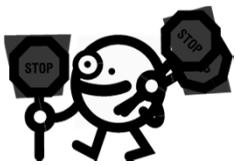
1. Suppressor	→	Biguanide – Metformin
2. Squirter	→	Sulfonylureas Meglitinides
3. Satiators	→	AmylinoMimetics Incretin Mimetics DPP-4 Inhibitors
4. Sensitizer	→	Thiazolidinediones (TZD)
5. Glucoretics	→	SGLT2 Inhibitors
6.Circadian Switchers	→	Dopamine Receptor Agonists
7. Slower	→	Alpha-glucosidase inhibitors

Diabetes Agents Considerations

- Diabetes medications can be used as monotherapy, in combo or with insulin
- Combining agents from different classes has additive effect
- Most reduce A1c 0.5 – 2.0%
- Not to be used during preconception, pregnancy or when breastfeeding

Biguanides – Suppressor Metformin (Glucophage®)

- Action: suppresses release of glycogen from the liver
- Who?
  - Fasting hyperglycemia
  - Dysmetabolic Syndrome
  - For pediatrics starting age 10
    - (XR age 17)



Glycogen Stopper

Biguanides - Metformin

- **Action:** decrease hepatic glucose (glycogen)
- **Names:**
  - Metformin (Glucophage)
    - Starting dose: 500 BID, max 2500mg daily
  - Metformin extended release (3 different versions)
    - Starting dose 500mg at dinner, max dose 2000 to 2500 mg daily
  - **Efficacy:**
    - Decrease fasting plasma glucose 60-70 mg/dl
    - Reduce A1C 1.0-2.0%

Biguanides - Metformin

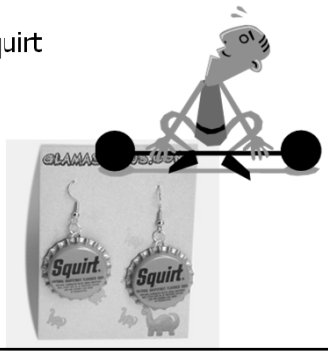
- Side effects
  - Diarrhea and abdominal discomfort
  - Lactic acidosis if improperly prescribed
  - Decrease LDL cholesterol and triglycerides
  - No weight gain, with possible modest weight loss
  - B12 deficiency can be assoc w/ nerve pain
- Hold prior to IV contrast dye studies and use caution during acute illness. Resume when kidney function adequate

Considerations
Biguanide - Metformin (Glucophage®)

- Contraindications due to lactic acidosis:
  - creatinine >1.4 females, >1.5 males
  - liver disease
  - alcohol abuse
  - over 80 years old
  - risk of acidosis
  - during IV dye study
  - CHF requiring meds

Sulfonylureas –

- Action: tells pancreas to squirt insulin all day
- Who?
  - Lean type 2



Sulfonylureas - Squirts

- Action: Increase endogenous insulin secretion
- Efficacy:
  - Decrease FPG 60-70 mg/dl
  - Reduce A1C by 1.0-2.0%
- Primary failures: about 20% no response
  - R/O glucose toxicity or low beta cell function
- Secondary failures: 5-10% shortly after initial response, many more later
  - Usually after 5 or more years of therapy due to natural history of DM 2

Sulfonylureas: 2nd Generation

Generic	Trade	Duration
Glyburide	Diabeta, Micronase, Glynase Prestabs	12-24 hrs
Glipizide*	Glucotrol, Glucotrol Xl	12-24 hrs
Glimepiride	Amaryl	16-24 hrs

*take short acting product on empty stomach

Sulfonylureas

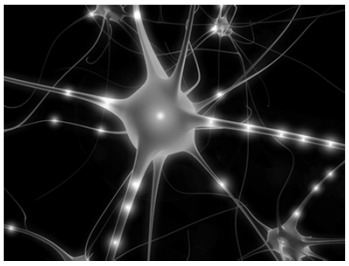
- Other Effects
  - Hypoglycemia
  - Weight gain
  - Cleared by kidney, use caution for pts with kidney problems
  - Generally the least expensive class of medication

What Medications Cause Hypoglycemia?

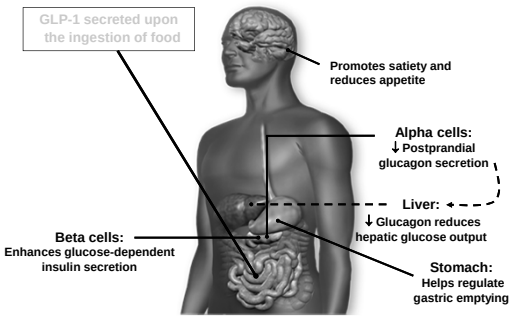
- Insulin
- Sulfonylureas
- Meglitinides
- Or any combo medication that includes these

Incretin Mimetics – "Gut Hormones" DPP-IV Inhibitors

- How do they work?



GLP-1 Effects in Humans
Understanding the Natural Role of Incretins



Adapted from Flint A, et al. *J Clin Invest*. 1998;101:515-520
Adapted from Larsson H, et al. *Acta Physiol Scand*. 1997;160:413-422
Adapted from Nauck MA, et al. *Diabetologia*. 1996;39:1546-1553
Adapted from Drucker DJ. *Diabetes*. 1998;47:159-169

GLP-1 degraded by DPP-4 w/in minutes

For all the Following GLP-1 Inhibitors

- Pancreatitis Warning
  - Please tell all patients to report signs right away and discontinue meds
  - Signs include:
  - Sudden abdominal pain, nausea and vomiting
- May also be associated w/ increased risk of pancreatic cancer? Studies ongoing.

Incretin Mimetics
Exenatide (Byetta), Liraglutide (Victoza)

- **Action:**
  - Insulin release in response to meal
  - Slows gastric emptying
  - Causes Satiety
- **Exenatide Dosing:** - 5-10 mcg ac break, dinner
- **Liraglutide Dosing**: 0.6 to 1.8mg ONCE a day
- **Efficacy:** Decreases A1c by 0.7%, wt by 3lbs
- **Indication**: For type 2s only - mono or in combo
- **Other**: In prefilled pens

Incretin Mimetics – Exenatide XR - Bydureon

- **Once a Week Dosing:** 2mg
- **Efficacy:** Decreases A1c by 1.6%, wt by ~6lbs
- **Indication**: For type 2s only
- **Other**: Pt will need to mix powdered form and inject
- **Caution**: not indicated for those with history of medullary thyroid tumor - pancreatitis warning

DPP-4 Inhibitors – "Incretin Enhancers"

Januvia (sitagliptin) – Tradjenta (linagliptin)
Onglyza (saxagliptin) Nesina (alogliptin)

- **Action:**
  - Increase insulin release w/ meals
  - Suppress glucagon
- **Dosing**: Januvia – 100mg a day
  Onglyza – up to 5mg a day
  Tradjenta – 5mg a day
- **Efficacy:** Decreases A1c by 0.6 -0.8%
- **Indication**: For type 2s

DPP-4 Inhibitors – "Incretin Enhancers"

Januvia (sitagliptin) – Tradjenta (linagliptin)
Onglyza (saxagliptin) Nesina (alogliptin)

- Do not cause wt gain or hypoglycemia
- Side effects – headache, runny nose, sore throat - watch for pancreatitis
- Cost $100 - $150 mo

Indications for Insulin Sensitizers Rosiglitazone (Avandia®), Pioglitazone (Actos®)

- Action: **Sensitizers**
- Who?
  - Insulin resistant patient
  - Dysmetabolic syndrome

Thiazolidinediones – TZD's

- **Action**: decrease insulin resistance by making muscle and adipose cells more sensitive to insulin. Decrease free fatty acids
- **Names**:
  - pioglitazone (Actos)
    - Dosing: 15-45 mg daily
  - rosiglitazone (Avandia) – restricted due to increased MI risk
- **Efficacy:**
  - Decrease fasting plasma glucose ~35-40 mg/dl
  - Reduce A1C ~0.5-1.0%
  - 6 weeks for maximum effect
  - $30 a month

Pioglitazone (Actos) Warning

Bladder Cancer Risk

- Risk increased with increasing dose and duration
- France has pulled Actos, Germany restricted access
- FDA Recommends
  - Do not use in pts with active bladder cancer.
  - Use with caution in pts w/ prior history of bladder CA
- Patient Instructions
  - Report symptoms of bladder cancer: blood or red color in urine; urgent need to urinate or pain while urinating; pain in back or lower abdomen.

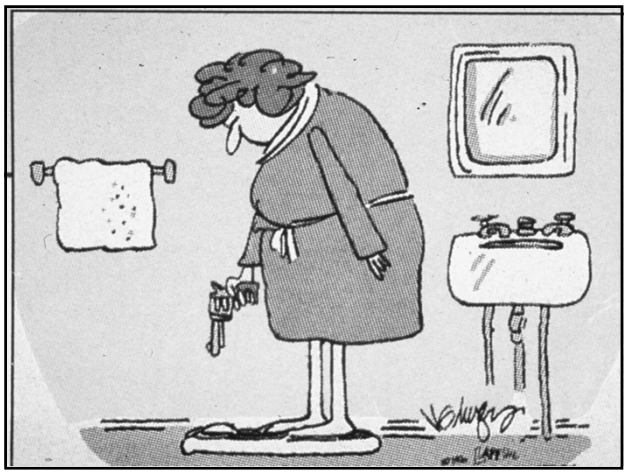
SGLT2 Inhibitors

- Cangliflozin (Invokana)
- "Glucoretic" - Inhibit the reabsorption of glucose in the proximal kidney tubules
- Monitor B/P, K+ & renal function.
- If eGFR 45-60, do not exceed 100 mg day. Don't use if eGFR<45.
- Side effects: hypotension, UTI, increased urination, genital yeast infections.
- Lowers A1c 0.7%–1.0%, wt loss 1-3 lbs.

DiaBingo - I

- Injected hormone that is an analog of amylin
- Glargine, Detemir, NPH are types of
- Breakdown of glycogen into glucose
- Anabolic hormone
- Insulin is released when glucose levels are low
- Once opened, insulin vials are good for one _____
- Elevated post-prandial glucose indicate need for pre-meal
- Epinephrine increases insulin resistance
- Creation of glucose from amino acids and lactate
- Decreasing renal function for people on insulin can cause
- Bolus insulins
- A hormone that increases blood glucose levels

Medical Nutrition Therapy



Medical Nutrition Therapy (MNT)

- Team led by Registered Dietitian
- Restore or maintain **near-normal** glucose
- Optimal lipid and blood pressure levels
- Calories sufficient to attain or maintain "reasonable body weight"

Nutrition Recommendations for Healthy Eating

ADA

Foods:

- Carbs 45-65% of intake
- Protein 10 - 20%
- Fat < 30% of calories (Saturated fat 7-10%)

- Weight Loss
  - If Goal ½ pound to 1 lb a week
  - Decrease intake 250-500 cals daily + exercise

- 2011 - New Sodium Restriction – limit to ½ tsp a day if + DM, 51+, African American, Kidney Dx

USDA 2011

USDA Food Pyramid
www.myplate.gov

Balancing Calories

- Enjoy your food, but eat less.
- Avoid oversized portions.

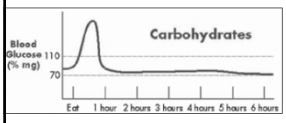
Foods to Increase

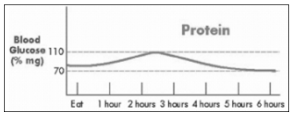
- Make half your plate fruits and vegetables.
- Make at least half your grains whole grains.
- Switch to fat-free or low-fat (1%) milk.

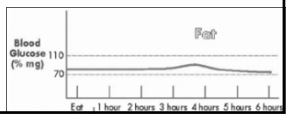
Foods to Reduce

- Compare sodium in foods like soup, bread, and frozen meals — and choose the foods with lower numbers.
- Drink water instead of sugary drinks.

How nutrients affect blood sugar







Carbohydrate foods

- Starch
- Fruit
- Milk
- Desserts

Remember: Carbohydrates are Essential

- Carbs have fiber, vitamins, minerals and phytonutrients
- Fiber helps to stabilize blood glucose and lower cholesterol
  - Helps control weight by providing sense of fullness
- Focus on eating consistent amounts of carbohydrate for blood glucose control

Carbohydrate Needs for Most Adults

	Grams	Servings
Each Meal	45-75 gm	3 - 5
Snacks	15-30 gm	1- 2

RDA 130 gm carbohydrate per day

The magic number is

15

Handy Meal Plan

- Per Meal Serving
  - Each finger = 15 gms carb (can have 3-4 servings/meal)
  - Palm of hand = 3 oz's protein
  - Thumbnail = 1 tsp fat serving

Label Lessons

Nutrition Facts

Serving Size 1/2 cup (114 g)
Servings Per Container 4

Amount Per Serving	
Calories 90	Calories from Fat 30
	% Daily Value*
Total Fat 3g	5%
Saturated Fat 0g	0%
Cholesterol 0g	0%
Sodium 300mg	13%
Total Carbohydrate 13g	4%
Dietary Fiber 3g	12%
Sugars 3g	
Protein 3g	

Vitamin A	80%	**Vitamin C**	60%
Calcium	4%	**Iron**	4%

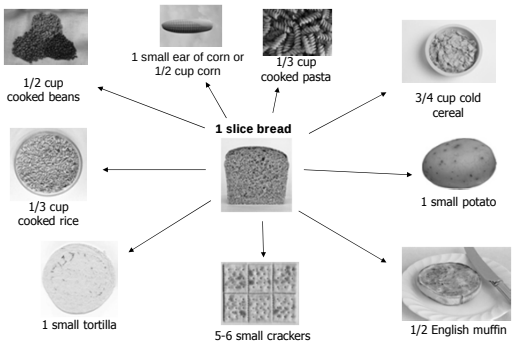
* Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories	2000	2500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2400mg	2400mg
Total Carbohydrate		300g	375g
Fiber		25g	30g

Calories per gram: Fat 9 Carbohydrates 4 Protein 4

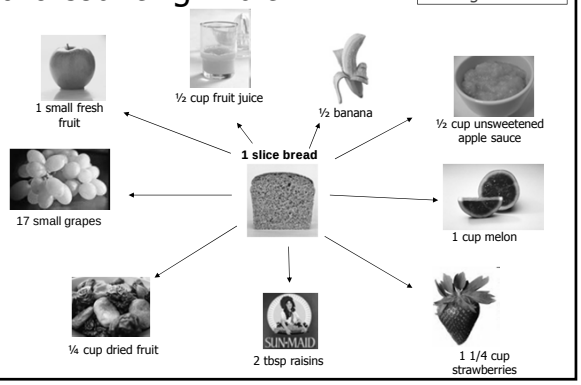
Carb counting- starch

Each Food has:
80 Calories
15 grams carb



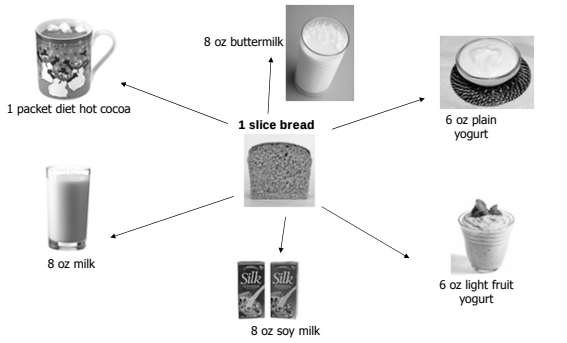
Carb counting- fruit

Each Food has:
60 Calories
15 grams carb



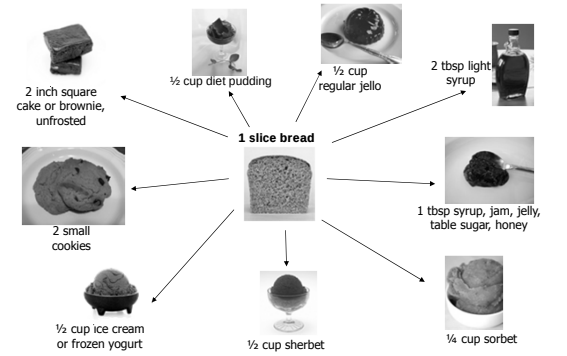
Carb counting- milk

Each Food has:
90-150 calories
12-15 grams carb



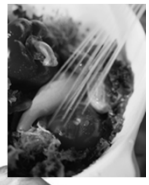
Carb counting - sweets

Each Food has:
Calories vary
15 grams carb



Foods that do not raise blood sugar

- Vegetables
- Meat
- Fat
- "Free" foods



Go Lean with Protein

- Choose lean protein
  - Poultry, fish, egg, lean beef
  - Plant sources- beans, lentils, nuts
  - Low fat cheese- cottage cheese, mozzarella cheese
- Limit high fat protein
  - Bacon & sausage
  - High fat cuts of beef
  - Whole milk cheese
- Serving size
  - 1 oz = ¼ cup
  - 3 oz = deck of cards

Fats- Aim for heart health

- Monounsaturated
  - Olive & canola oils
  - Nuts
  - Avocado
- Polyunsaturated
  veg oils: canola, corn, walnut, safflower, soybean
- Saturated fats (LIMIT)
  - Solid
  - Animal
  - Tropical (palm, coconut)
  - Trans fats (deep fried)

Serving sizes
- 1 tsp butter, margarine, oil, mayonnaise
- 1 Tbsp salad dressing, cream cheese, seeds
- 2 Tbsp avocado, cream, sour cream
- 1 slice bacon

Don't limit Non-Starchy Vegetables

- Non-starchy vegetable category
- Contains about 5 gm carb per serving

- But much of the carb comes from fiber
  - Not digested
  - Has minimal affect blood sugar*
  - Helps to keep us full
  - Aim for 25-35 gm fiber daily

Using Alcohol Safely

- Recommended Intake
  - None to 1 drink a day (women)
  - None to 2 drinks a day (men)
  - (12oz beer, 6oz wine, 1 oz spirits)
- Alcohol can worsen:
  - Triglyceride levels
  - Nerve disease, pancreatitis
- Always eat when drinking to prevent hypo

Ms. Gonzales' General Diet Pattern

Break	Lunch	Dinner	Night
5 corn tortillas, 1/2 c. beans, salsa, peppers, egg beaters	Sandwich, low fat potato chips, 1c. juice, 2-4 lowfat cookies	Lg bowl low salt soup, 1c. rice, BBQ meat, salad & cooked vegs 1 glass wine	1 bowl of cereal
Avg BG 120's	**Avg BG 200's**	**Avg BG 200's**	**Avg BG 180's**

Diabetes Bingo
"DiaBingo"
Shout out Right Answer

DiaBingo - N

N Injected hormone called an incretin mimetic
N DPP demonstrated that exercise and diet reduced risk of DM by ___%
N An _____a day can help prevent heart attack and stroke
N Rebound hyperglycemia
N Scare tactics are effective at motivating patients to change behavior

N Losing ___ % of body weight, can improve blood glucose, BP, lipids
N Drugs that can cause hyperglycemia
N 2/3 cups of rice equals _____ serving carbohydrate
N A1c of 7% equals glucose of
N One % drop in A1c reduces risk of complications by ___ %

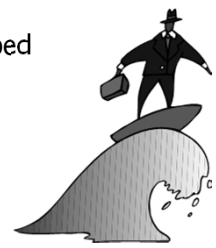
N 1 gm of fat equal _____kilo/calories

N Metabolic syndrome = hyperglycemia, hyperlipidemia, hypertension

N 1% A1c = _____ of Blood Glucose

High Numbers Got You Down?

- **By getting glucose less than 150 you will**:
  - have more energy
  - spend fewer days in bed
  - feel less depressed
  - urinate less often
  - improve your vision
  - think more clearly
  - miss work less often



Testa, Simonson JAMA 280: 1998

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Thank You!